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EXAMINER	
RICHARDS, N DREW	

ART UNIT	PAPER NUMBER
2815	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 08/520,079	Applicant(s) YAMAZAKI ET AL.	
	Examiner N. Drew Richards	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 May 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *73-116,123-141 and 143-155* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *73-116,123-141 and 143-155* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 August 1995* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 73-116, 123-141 and 143-155 are rejected under 35 U.S.C. 103(a) as being obvious over Zhang et al. (USPAT 5,563,426, Zhang).

The applied reference appears to have a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing

that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

With regard to claim 73, Zhang discloses in figure 4c a thin film transistor. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island (3) over a substrate (1a) having an insulating surface (1b). Zhang discloses in figures 4b and 4c source (25a and 25c) and drain regions (25b and 25d) in said semiconductor island. Zhang discloses in figure 4b a channel forming region (between 25a and 25b in figure 4b) between said source and drain regions. Zhang discloses in figures 4a – 4c a gate insulating film (22) adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode (23a) adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region has no grain boundary (4). No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor island includes a spin density not higher than 1×10^{17} cm^{-3}, because an identical spin density is a property that must be shared by products that result from two processes that are the same. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than l x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is

not greater than l x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not greater than l x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 74, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein the crystalline semiconductor island comprise a material of Ni.

With regard to claim 75, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5 x 10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not greater than 5 x 10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not greater than 5 x 10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 76, Zhang discloses in column 9, lines 38 – 45 a thin film transistor wherein said semiconductor island includes the point defect (oxygen) of less1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches wherein said semiconductor island includes a point defect of 1 x 10^{16} cm^{-3} or more. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to have said

semiconductor island include a point defect of 1×10^{16} cm^{-3} or more in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang teaches in column 11, lines 47 – 56 that is obvious to have the hydrogen element for neutralizing the point defect at a concentration of 1×10^{18}.

With regard to claim 77, it is obvious in Zhang wherein said semiconductor island includes the spin density not lower than 1×10^{15} cm^{-3}.

With regard to claim 78, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 79, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1×10^{18} cm^{-3}, and oxygen at a concentration less than 1×10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 80, Zhang discloses in figure 4c a thin film transistor. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region

between said source and drain regions. Zhang discloses in figures 4a – 4c a gate insulating film on at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode over said channel forming region having said gate insulating film therebetween, wherein said channel forming region has no grain boundary. Zhang discloses in column 9, lines 38 – 45 a thin film transistor wherein said semiconductor island includes the point defect (oxygen) of less1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches wherein said semiconductor island includes a point defect of 1 x 10^{16} cm^{-3} or more. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to have said semiconductor island include a point defect of 1 x 10^{16} cm^{-3} or more in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than l x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than l x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than l x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 81, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein the crystalline semiconductor island comprise a material of Ni.

With regard to claim 82, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5×10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 83, Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said semiconductor island includes hydrogen for neutralizing the point defect at a concentration less than l x 10^{20} cm^{-3}. It is not clear if Zhang teaches that the hydrogen concentration is not lower than 1×10^{-15} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not lower than 1×10^{-15} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 84, No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor island

includes a spin density of 1 x 10^{15} to 1 x 10^{17} cm^{-3}, because an identical spin density is a property that must be shared by products that result from two processes that are the same.

With regard to claim 85, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 86, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 87, Zhang discloses in figure 4c a semiconductor device. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to

said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than I x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than I x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than I x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 88, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 89, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5×10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 90, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 91, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1×10^{18} cm^{-3}, and oxygen at a concentration less than 1×10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 92, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 93, Zhang discloses in figure 4c semiconductor device. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than l x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than l x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than l x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38

– 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 94, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 95, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5×10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 96, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 97, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1×10^{18} cm^{-3}, and oxygen at a concentration less than 1×10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 98, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 99, Zhang discloses in figure 4c semiconductor device. Zhang discloses in column 9, lines 38 – 45 a p-channel thin film transistor. Zhang discloses in column 9, lines 38 – 45 an n-channel thin film transistor. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said

semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than l x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than l x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than l x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 100, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 101, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5 x 10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher

than 5×10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 102, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 103, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1×10^{18} cm^{-3}, and oxygen at a concentration less than 1×10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 104, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 105, Zhang discloses in figure 4c semiconductor device. Zhang discloses in column 9, lines 38 – 45 a p-channel thin film transistor. Zhang discloses in column 9, lines 38 – 45 an n-channel thin film transistor. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon at a concentration not higher than 5 x 10^{18} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon at a concentration not higher than 5 x 10^{18} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than l x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than l x 10^{20} cm^{-3}. MPEP 2144.05 states that

overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than I x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 106, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 107, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5 x 10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than 5 x 10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than 5 x 10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 108, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 109, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen

at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 110, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 µm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 µm when the metal portions are set from 25 – 50 µm apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 111, Zhang discloses in figure 4c semiconductor device. Zhang discloses in figures 8a and 8b; and column 9, lines 28 - 37 an active matrix circuit portion including at least a first thin film transistor. Zhang discloses in column 9, lines 38 – 45 a driving circuit portion including at least a second thin film transistor. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said

crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than I x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than I x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than I x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 112, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 113, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5 x 10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than 5 x 10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than 5 x 10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 114, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 115, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1×10^{18} cm^{-3}, and oxygen at a concentration less than 1×10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 116, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 µm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 µm when the metal portions are set from 25 – 50 µm apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 123, Zhang discloses in figure 4c a semiconductor device. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a –

2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island is formed in a monodomain region which contains no grain boundary. Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending specification. Therefore Zhang must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor device has a S value of 0.03-0.3, because an identical S value is a property that must be shared by products that result from two processes that are the same. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than l x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than l x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in

the art to use the hydrogen atom concentration of not higher than I x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes at least one selected from the group consisting of a p-channel thin film transistor and an n-channel thin film transistor. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes an n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining

the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 124, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 125, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5×10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 126, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 127, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1×10^{18} cm^{-3}, and oxygen at a concentration less than 1×10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would

have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1×10^{16} cm^{-3}, and oxygen at a concentration not lower than 1×10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 128, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 µm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 µm when the metal portions are set from 25 – 50 µm apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 129, Zhang discloses in figure 4c semiconductor device. Zhang discloses in figures 1a – 1c, 2a - 2d, and 4a – 4c a crystalline semiconductor island on an insulating surface. Zhang discloses in figures 4b and 4c source and drain regions in said semiconductor island. Zhang discloses in figure 4b a channel forming region between said source and drain regions. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate insulating film adjacent to at least said channel forming region. Zhang discloses in figures 1a- 1c, 2a – 2d, and 4a – 4c a gate electrode adjacent to said channel forming region having said gate insulating film therebetween, wherein said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than 5 x 1018 cm-3, wherein said channel forming region is formed in a monodomain region which contains no grain boundary. No differences have been pointed out in the formation of the channel forming region of Zhang and the channel forming region of the current pending claim in view of the currently pending

specification. Therefore Zhang must teach in figures 1a – 1c, 2a – 2d and 4a – 4c wherein said semiconductor device has a S value of 0.03-0.3, because an identical S value is a property that must be shared by products that result from two processes that are the same. Zhang discloses in figures 4c and column11, lines 47 – 56 wherein said crystalline semiconductor island includes hydrogen at concentration less than I x 10^{20} cm^{-3} (i.e. the known atomic density of Si is 10^{22} cm^{-3}, less than 5% of 10^{22} is less than 10^{20}). It is not clear if Zhang teaches that the hydrogen concentration is not higher than I x 10^{20} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the hydrogen atom concentration of not higher than I x 10^{20} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes at least one selected from the group consisting of a p-channel thin film transistor and an n-channel thin film transistor. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that

of the claimed invention. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes an n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Further, any changes in particular device concentrations or properties would have been routine experimentation for one of ordinary skill seeking to maximize device function in the device of Zhang.

With regard to claim 130, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 wherein said crystalline semiconductor island comprises a material Ni.

With regard to claim 131, Zhang discloses in figures 1a, 1b, and 2a; and column 6, lines 19 – 40 a thin film transistor wherein said material is included in said semiconductor island at a concentration less than 5×10^{19} cm^{-3}. It is not clear if Zhang teaches that the material is included in the semiconductor at a concentration not higher than 5×10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use the material included in the

semiconductor at a concentration not higher than 5 x 10^{19} cm^{-3}in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 132, Zhang discloses in column 4, lines 18 – 20 wherein said semiconductor island is a silicon island.

With regard to claim 133, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not lower than 1 x 10^{16} cm^{-3}, and oxygen at a concentration not lower than 1 x 10^{17} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 134, Zhang teaches in figures 1a, 1b, 2a – 2d; and column 12, lines 1 – 30 wherein said monodomain region has a grain size of 50 μm or more. It should be noted that the crystal grains (3) grown around metal portions (2) must have a grain size of 50 – 100 μm when the metal portions are set from 25 – 50 μm apart as disclosed by Zhang in column 12, lines 1 – 30.

With regard to claim 135, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore,

measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 136, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 137, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable

weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 138, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 139, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure

the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 140, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 141, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to

understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 143, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 144, Zhang discloses in column 9, lines 38 – 45 wherein each of the concentrations of carbon, nitrogen and oxygen is measured. A method of measuring does not define a patentable feature in a device claim. Therefore, measuring the concentration of carbon, nitrogen and oxygen by the well known technique of secondary ion mass spectroscopy (SIMS) does not bear any patentable weight in this device claim. Further, it would have been obvious to one of ordinary skill in the art at the time of the present invention to use the technique of SIMS to measure the concentration of carbon, nitrogen and oxygen in the device of Zhang in order to understand the electrical characteristics of the device as it relates to these features. This understanding would result in better device control.

With regard to claim 145, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1×10^{18} cm^{-3}, and oxygen at a concentration less than 1×10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than 5×10^{18} cm^{-3}, and oxygen at a concentration not higher than 5×10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than 5×10^{18} cm^{-3}, and oxygen at a concentration not higher than 5×10^{19} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 146, Zhang discloses in column 9, lines 38 – 45 wherein the thin film transistor is an n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

With regard to claim 147, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less

than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3}, and oxygen at a concentration not higher than 5 x 10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3}, and oxygen at a concentration not higher than 5 x 10^{19} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 148, Zhang discloses in column 9, lines 38 – 45 wherein the thin film transistor is one of a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

With regard to claim 149, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen

at a concentration not higher than 5 x 10^{18} cm^{-3}, and oxygen at a concentration not higher than 5 x 10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3}, and oxygen at a concentration not higher than 5 x 10^{19} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 150, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3}, and oxygen at a concentration not higher than 5 x 10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3}, and oxygen at a concentration not higher than 5 x 10^{19} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 151, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}, and oxygen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3}, and oxygen at a concentration not higher than 5 x 10^{19} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious.

It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than 5×10^{18} cm^{-3}, and oxygen at a concentration not higher than 5×10^{19} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 152, Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and

that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

With regard to claim 153, Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention. Zhang discloses in column 9, lines 38 – 45 wherein the semiconductor device includes a n-channel thin film transistor having a mobility in a range of 30 – 150 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes an n-channel thin film transistor having mobility in a range of 500-1000 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free n-channel monodomain region with mobility in a range of 500-1000 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

With regard to claim 154, Zhang discloses in column 9, lines 38 – 43 wherein the crystalline semiconductor island includes carbon and nitrogen at a concentration less than 1 x 10^{18} cm^{-3}. It is not clear if Zhang teaches that said crystalline semiconductor island includes carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3}. MPEP 2144.05 states that overlapping ranges are obvious. It would have been obvious to one of ordinary skill in the art to use carbon and nitrogen at a concentration not higher than 5 x 10^{18} cm^{-3} in the device of Zhang because the current claimed range and the disclosed range in Zhang overlap.

With regard to claim 155, Zhang discloses in column 9, lines 38 – 45 wherein the second thin film transistor is one of a p-channel thin film transistor having a mobility in a range of 20 – 100 cm^2/Vs. Zhang is silent to the fact that the semiconductor device includes a p-channel thin film transistor having mobility in a range of 200-400 cm^2/Vs. Mobility is a function of the purity of the single crystal (monodomain) semiconductor. MPEP section 2144.04, VII teaches that it is obvious to one of ordinary skill in the art to have a more purely defect free p-channel monodomain region with mobility in a range of 200-400 cm^2/Vs in the device of Zhang. This is because the prior art teaches a suitable method for obtaining the claimed mobility, and that fact that the monodomain region of Zhang has the same utility as that of the claimed invention.

Alternatively, even if the Ohtani et al. and Yamazaki et al. evidentiary references are taken as proving for fact that grain boundaries exist in the crystal regions 3 of Zhang, Zhang is still considered to render the claims obvious. Yamazaki et al. teach in

figure 5A that the grain boundaries (solid lines differentiating between regions A-H) all extend outward from the corners of the starting region (inner cross-hatched rectangle). If grain boundaries along these directions were applied to the device of Zhang, the grain boundaries would not exist in the channel region. In figures 1(A)-(C) of Zhang, the starting points are formed as squares 2, if these starting squares are superimposed over the devices shown in figure 1(C), and the "grain boundaries" are drawn in extending outward from the corners of the starting squares, one can easily see that the grain boundaries will not exist in the channel region. Thus, even if grain boundaries are formed as taught by Yamazaki, these grain boundaries will not exist in the channel regions of the transistors of Zhang.

3. For the sake of argument, if it can be positively shown that additional grain boundaries (other than those explicitly shown in Zhang) inherently exist in the device of Zhang, and that these additional grain boundaries inherently exist in the channel region of Zhang, the following rejection applies.

4. Claims 73-86, 93-98, 105-110, 129-136, 138, 140, 144-148, 150 and 153 are rejected under 35 U.S.C. 103(a) as being obvious over Zhang et al. (USPAT 5,563,426, Zhang), in view of any one of JP 6-140631, JP 6-037112, US 5273921, or US 5207863.

The applied reference appears to have a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a)

might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

This rejection is applied in an abundance of caution in order to present applicant with a thorough examination of their claims, in the chance that applicant can definitively prove that grain boundaries exist in the channel region of Zhang.

Zhang et al. teach of render obvious all the limitations of claims 73-86, 93-98, 105-110, 129-136, 138, 140, 144-148, 150 and 153 except for the teaching of the channel forming region having no grain boundaries. Nonetheless, even if grain boundaries are inherently present in the channel forming region of Zhang (a fact that has yet to be proven) it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Zhang so that the channel regions are not formed in the same region as the crystal grain boundaries. JP 6-140631, JP 6-037112 (see

paragraph [0008] of the translation, for example), US 5273921 (see column 3 lines 23-27, column 4 lines 25-26 and column 8 lines 36-40, for example), and US 5207863 (see column 9 lines 13-18, for example) all acknowledge that it is advantageous to form a thin film transistor where the channel region is a monodomain reigon that contains no crystal grain boundaries. These references all teach that the transistor gets better performance when the channel region contains no crystal grain boundaries. Thus, it would have been obvious to one of ordinary skill in the art to modify the transistor of Zhang to form the transistors in regions such that the channels contain no crystal boundaries.

Response to Arguments

5. Applicant's arguments filed 5/22/06 have been fully considered but they are not persuasive.

Applicant has argued that the Ohtani and Yamazaki references do establish the inherency of grain boundaries in the channel region of Zhang. Applicant points out that Yamazaki in figure 5B shows grain boundaries existing throughout each of the regions A-H in figure 5A. While figure 5B may show grain boundaries, the Examiner is unconvinced that the showing of grain boundaries in the specific process of Yamazaki provides proof of inherent grain boundaries in the channel regions of Zhang. As pointed out in the previous Office Action, the processes used to form the crystalline regions in Yamazaki and Ohtani are different than the process used in Zhang. Yamazaki and

Ohtani both teach crystallization methods that employ a single heating or annealing step. Zhang teach the use of two separate heating or annealing steps. These different processes will result in different final structures. Thus, the fact that grain boundaries may exist in the Yamazaki and Ohtani references does not prove that the grain boundaries will exist when the crystalline region is formed by a different method in Zhang.

Applicant then argues that Zhang does not teach the claimed grain size or the claimed mobilities due to the supposed grain boundaries. This is not persuasive as it has not been convincingly shown that grain boundaries inherently exist in the layer of Zhang.

Applicant further argues that since Zhang does not explicitly disclose an intent to form a channel region by avoiding grain boundaries there is no motivation for combining Zhang with JP 6-140631, JP 6-037112, US 5273921, or US 5207863. This is not persuasive as the references relied upon as the secondary reference each provide motivation in that they explain a desirability of forming the transistor with no grain boundaries in the channel region for better device operation. Thus, even though Zhang may not provide the motivation to combine by itself, the prior art as a whole provides motivation and suggestion for the proposed combination.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday-Friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

N. DREW RICHARDS
PRIMARY EXAMINER